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This work was partially supported by the Department for Environment, Food and Rural Affairs [grant numbers AW1404 and AW1407].

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Abstract

Building on a study examining children's knowledge and care of companion animals, this paper examines emotional attachment to dogs. It uses a large-scale dataset on children's health and well-being (*n* = 6,700) to explore the connection between attachment to dogs, compared with other companion animals, and a range of well-being indicators. Findings reveal stronger attachments to dogs that are linked with well-being. Some associations are also evident for children reporting a strong bond with small mammals. A mixed pattern of results is evident for cats, and no associations were apparent for those with fish, reptiles or amphibians. Relationships with dogs appear distinctive; children's sense of emotional reciprocity and shared enjoyment of play, acting as possible mechanisms by which attachment translates into benefits. Emotional connections to all types of animal weaken with age. This may be due to the changing nature of attachment as children move through adolescence.

Keywords: attachment, children, companion animal, dogs, well-being

The "special" relationship between humans and dogs (Allen, Blascovich, Tomaka & Kelsey, 1991; Hart, 1995) has recently become a topic of interest across a wide range of disciplines (e.g., Payne, Bennett & McGreevy, 2015; Westgarth, Christley & Christian, 2014). Such affiliations have been investigated extensively among adults. Many studies suggest that dogs have a significant impact on human health (Wells, 2009); directly, through companionship, touch and exercise (González Ramírez & Landero Hernández, 2014), and indirectly, through increasing social contact (Wood, Giles-Corti, Bulsara & Bosch, 2007). Interactions with dogs have been linked to reduced risk of cardiovascular disease (Levine et al., 2013), loneliness, and depression (Le Roux & Kemp, 2009).

Research on dogs' role in enhancing children's health usually concentrates on specific groups or Animal-Assisted Therapies (Chur-Hansen, McArthur, Winefield, Hanieh & Hazel, 2014). Within the wider child population, dogs have been found to reduce behavioral stress (Hansen, Messinger, Baun & Megel, 1999), and enhance concentration, self-confidence, and social competence (Hediger & Turner, 2014; Kotrschal & Ortbauer, 2003). Recent findings also link dog walking with increased outdoor play/independent mobility (Christian et al., 2014). Yet the focus is predominantly on health risks, particularly the extent of dog bites/attacks and how to prevent them (Chapman, Cornwall, Righetti & Sung, 2000).

Being with a dog is said to ease social communication (McNicholas & Collis, 2000). However, the relationship with the individual dog may be more significant for children's psychological well-being, as they often describe dogs as special friends or good playmates (Bryant, 1982; Muldoon, Williams & Lawrence, 2015; 2016). Dogs seem to be the favorite companion animal in families, and the species children are most attached to, particularly if they have no siblings (Rost & Hartman, 1994). If dogs are experienced in the recognition of

human gestures and emotional expressions (Müller, Schmitt, Barber & Huber, 2015), the relationship is likely to feel more reciprocal than with other companion animals.

Existing research tends to consider companion animal attachment and the "pet effect" in general terms (Herzog, 2011), neglecting both the possibility that dimensions of attachment vary according to animal type, and findings that negate the idea that companion animals confer advantages (Herzog, 2011). This paper explores the possibility that a close connection with a dog benefits children and adolescents, seeking to answer the following questions:

(1) Is attachment stronger among children with dogs compared with children who have other types of animal?
(2) Is the nature of attachment different according to animal type?
(3) Do children with a strong attachment to their dog/s exhibit a more positive pattern of socio-emotional well-being than children who do not have this relationship?
(4) Are patterns of socio-emotional well-being evident for children who have a strong attachment to different types of animal?

The data presented here were generated during a UK government funded project exploring how a duty of care towards animals might be promoted among children, with a view to developing an evidence-based intervention to enhance knowledge, attitudes and behavior.

Methods

The impetus for this paper came from our earlier qualitative study with children (30 girls, 23 boys) that employed focus groups to explore their knowledge of companion animals' welfare needs and their care and responsibility for these animals in their home

(Muldoon et al., 2015; 2016). Children appeared to express far more affection for dogs than other animals throughout the groups. Dogs were viewed as friends; children emphasizing the physicality of their relationship, and perceiving dogs to be psychologically attuned to them (especially more than cats). Children's fondness of dogs seems due, in large part, to their playful and friendly character and the reciprocal nature of the relationship - the support, affection, and understanding the child feels they receive from the dog.

Accordingly, a study was designed to examine within the wider population of children and adolescents, the extent to which attachment to dogs: (a) is stronger than attachment to other companion animals; (b) differs from emotional connections with other animals, and (c) is associated with any specific benefits for well-being. This was achieved through incorporating a measure of a child's/adolescent's relationship with their companion animal/s into a well-established cross-national study. The 'Health Behaviour in School-aged Children' (HBSC) World Health Organization (WHO) collaborative study has administered surveys every four years since 1982 (see http://www.hbsc.org). It examines change over time in young people's well-being, health behaviors and social contexts, with a view to influencing public health policy. For our purposes, this allowed examination of differences in attachment according to type of animal and any associations with well-being.

Participants

Data for this investigation came from the 2010 HBSC Study in Scotland. The baseline sample, from which smaller sub-samples were drawn, included all children and adolescents who responded to questions about the type of animals sharing their home and completed the "Short Attachment to Pets Scale" (SAPS) discussed below (n = 6,700; age 11 [1021 boys,

1044 girls], age 13 [1060 boys, 1043 girls], age 15 [1209 boys, 1323 girls]). Parental consent was obtained.

Materials

Participants were asked in the survey if they had any companions animals and to state how many, selecting the type/s of animal from a list. They were subsequently asked to respond to nine items that constitute the SAPS. This scale was developed for inclusion in the HBSC Study by Muldoon and Williams (2009) because pre-existing measures of attachment were too lengthy and most had been developed in the USA. Items from established attachment measures were incorporated into the SAPS but these were chosen, and wording amended, as a result of our qualitative research with children in Scotland (Muldoon et al., 2015; 2016). The scale includes questions on key aspects of children's attachment (friendship/ companionship, mutual understanding, shared activities, and emotional support), and their overall liking/love of animals. Participants are asked to respond on a 5-point Likert scale (1=Strongly agree, 5=Strongly disagree), and a global one-dimensional mean score is calculated. A study assessing the validity of this scale was carried out with 7159 pupils (age 11, 13 and 15 years) who completed the 2010 HBSC survey in England and Scotland and were identified as having companion animals at home (Marsa-Sambola et al., 2016). Factor analysis resulted in a one-factor solution (explaining 67.78 % of the variance). Cronbach's alpha for the scale was 0.894, and the item-total correlation ranged from 0.368 to 0.784.

The following measures of well-being (all validated, some extensively) were also included in this study:

An adapted version of the Cantril Ladder (Levin & Currie, 2014) presents children with a ladder, '10' (at the top) indicating the best possible life, and '0' (at the bottom), the worst possible. Children are asked where they currently stand on the ladder. Although binary categorization (good vs. poor quality of life) can be used, it is most often analyzed (as we have done) as a continuous measure.

The Kidscreen 10 Index (Ravens-Sieberer et al., 2005) uses 10 items (on a 5-point Likert scale) to assess subjective health and well-being, providing a global one-dimensional score; higher scores indicating good quality of life. Interested in the capacity of companion animals to alleviate loneliness, we analyzed one item separately: "Thinking about the last week... Have you felt lonely?" (1 = Never, 2 = Hardly ever, 3 = Sometimes, 4 = Often, 5 = Always). Answers were dichotomized as: 'Did not feel lonely' (1 & 2) versus 'Did feel lonely' (3-5).

The General Health Questionnaire (GHQ-12) (Goldberg et al., 1997) is a short version of the original GHQ measuring adolescent psychiatric well-being. Here, it was used with 15-year-olds only; a higher mean score indicating more positive well-being. It asks how their health has been over the past few weeks.

The following single-item measures developed for HBSC (Currie et al., 2011) were also used. Coding was consistent with national reports of HBSC data, with the exception of 'feeling left out', which was coded to be consistent with the other negatively oriented question about loneliness.

- "How often do you feel confident in yourself?," and "How often do you feel happy?" (1=Never, 2=Hardly ever, 3=Sometimes, 4=Often, 5=Always). Answers were dichotomized as: 'Always confident/happy' (5) against all other responses.

- "In general, how do you feel about your life at present?" (1=I feel very happy, 2=I feel quite happy, 3=I don't feel very happy, 4=I'm not happy at all). Answers were dichotomized as: 'Very happy' (1) against other responses.
- "How often do you feel left out of things?" (1=Never, 2=Hardly ever, 3=Sometimes, 4=Often, 5=Always). Answers were dichotomized as: 'Do feel left out' (3-5) versus 'Do not feel left out' (1 & 2).
- "Would you say your health is…?" (1=Excellent, 2=Good, 3=Fair, 4=Poor). Answers were dichotomized as: 'Good health' (1 & 2) versus 'Poor health' (3 & 4).
- "How easy is it for you to talk to your mother/father about things that really bother you?" (1=Very easy, 2=Easy, 3=Difficult, 4=Very difficult, 5=Don't have or don't see the person). Excluding participants selecting 5, responses were dichotomized as: 'Easy' (1 & 2) versus 'Difficult' (3 & 4) communication.

Detailed procedures for the HBSC study are described in Currie et al. (2011). The questionnaire was administered in schools by teachers, following precise instructions. On completion, pupils placed their questionnaires in sealed envelopes to preserve anonymity.

Analysis

Analyses were undertaken to examine (a) the degree and nature of children's attachment to dogs, and (b) differences between children with different animal companions on the well-being measures. Chi-squared tests were employed for categorical single-item measures, whereas Univariate and Multivariate ANOVAs and t-tests were used to examine mean scores. Partial eta squared is provided as a measure of effect size (for multivariate analyses) and Cohen's d (1988) for the standardized differences between two means. When examining whether strong attachment was associated with well-being, a Bonferroni

correction was applied to control for increased possibility of type-1 error. As eleven measures were included, the *p* value was reduced to .005. This was also applied when examining different elements of the SAPS.

Results

Is attachment stronger among children with dogs?

Of the 6700 valid responses, 41.3% had companion dogs, 29.6% had "other" types of animal and 28.1% had no animals. Using these three groups, differences in overall attachment were investigated using the mean SAPS score. Those with no animals were asked when completing the SAPS to imagine how they would feel if they had one, ensuring all children could answer the same questions. This category provides a comparison group or baseline. Table 1 shows, in line with expectations, a significant main effect of animal type; those with dogs were more strongly attached to their animal than children with other animals (*mean difference* = .38, $p < .001$, $d = .45$) and the baseline group with none (*mean difference* = .62, $p < .001$, $d = .68$). Children with animals other than dogs also showed stronger attachment than those with none, who imagined what they would feel like (*mean difference* = .25, $p < .001$, $d = .25$).

Table 1: Differences in Mean SAPS Scores According to the Presence of Animals in the Family Home (The Whole Sample)

		Dog/s			Other animal/s			No companion animal			Total		
Gender	**Age**	N	Mean	Std.D	N	Mean	Std.D	N	Mean	Std.D	N	Mean	Std.D
Girls	11	426	4.41	.59	365	4.04	.81	251	3.95	.92	1042	4.17	.79
	13	467	4.06	.71	336	3.72	.90	238	3.39	1.05	1041	3.80	.90
	15	558	3.80	.82	368	3.39	.94	391	3.08	1.09	1317	3.47	.99
	Total	1451	4.06	.76	1069	3.71	.92	880	3.41	1.09	3400	3.78	.95
Boys	11	374	4.28	.66	345	3.81	.87	296	3.71	1.01	1015	3.95	.88
	13	439	3.94	.74	284	3.45	.83	324	3.33	.99	1047	3.62	.89
	15	520	3.66	.79	294	3.23	.88	387	3.07	1.04	1201	3.36	.93
	Total	1333	3.92	.78	923	3.52	.89	1007	3.34	1.04	3263	3.63	.94

Main effects
Companion animal type: F (2, 6645) = 295.27, $p < .001$, $\eta_p^2 = .08$
Age: F (2, 6645) = 322.11, $p < .001$, $\eta_p^2 = .09$
Gender: F (1, 6645) = 47.69, $p < .001$, $\eta_p^2 = .01$

There was also a main effect of gender, girls showing stronger attachment than boys (*mean difference* = .15, $p < .001$, $d = .16$). Age group was also influential, but there were no interaction effects. Attachment in all groups was higher among 11-year-olds, who had higher scores than 13-year-olds (*mean difference* = .39, $p < .001$, $d = .40$) and 15-year-olds (*mean difference* = .66, $p < .001$, $d = .71$). Thirteen-year-olds, in turn, had higher scores than 15-year-olds (*mean difference* = .28, $p < .001$, $d = .31$).

To enable more detailed comparisons across different species of companion animal, children/adolescents who lived with more than one animal type or with no animals were eliminated from further analyses. Remaining participants were then grouped according to the type of animal that shared their home, permitting exploration of the differences in attachment to a broader range of animal companions (see Table 2).

Table 2: Proportions of Children with Different Companion Animals (A More Detailed Look at Specific Animal Types with a Smaller Sample)

Animal type	Frequency	Percentage	Valid Percentage
No animals	1902	28.1	39.1
Dog/s	1433	21.2	29.5
Cat/s	669	9.9	13.8
Small mammal/s	382	5.6	7.9
Fish, reptile, amphibian/s	411	6.1	8.5
Bird/s	63	.9	1.3
Missing data*	1911	28.2	
Total	6771	100.0	

* The 1911 'missing' children includes those who report that more than one type of animal shares their home

Univariate ANOVA was repeated, excluding those with birds (due to small sample size). Again, main effects of gender, F (1, 2854) = 21.03, $p < .001$, $\eta_p^2 = .01$, age group, F (2, 2854) = 110.58, $p < .001$, $\eta_p^2 = .07$, and animal type F (3, 2854) = 120.56, $p < .001$, $\eta_p^2 = .11$ were revealed, and a small interaction between gender and animal type, F (3, 2854) = 3.56, $p < .05$, $\eta_p^2 = .004$. Figures 1 and 2 present the results for boys and girls. Children with dogs were more strongly attached than other children. Those with cats had higher scores than those with small mammals, fish, reptiles or amphibians, and children with small mammals were more strongly attached than the latter group (all p values were less than .001). Girls report stronger attachment than boys to all types of animal, except fish, reptiles and amphibians.

Figure 1: Boys' attachment by age and companion animal type

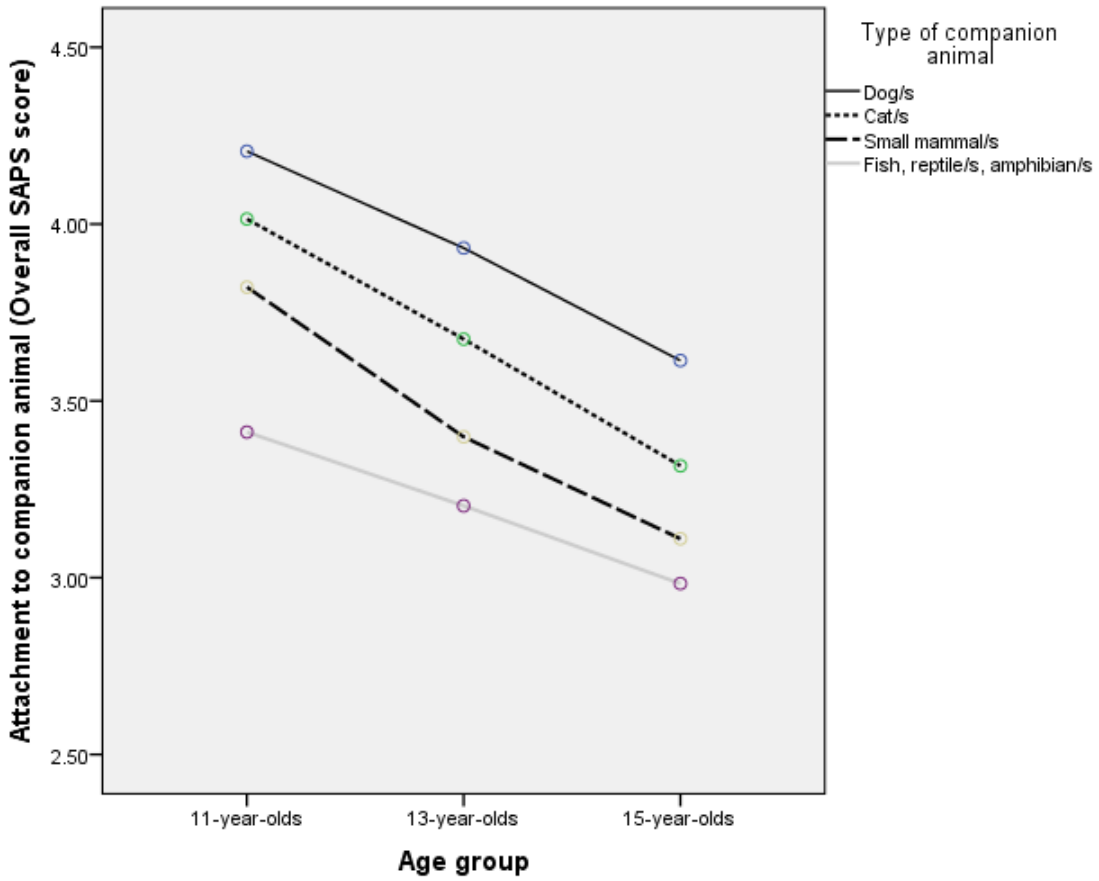
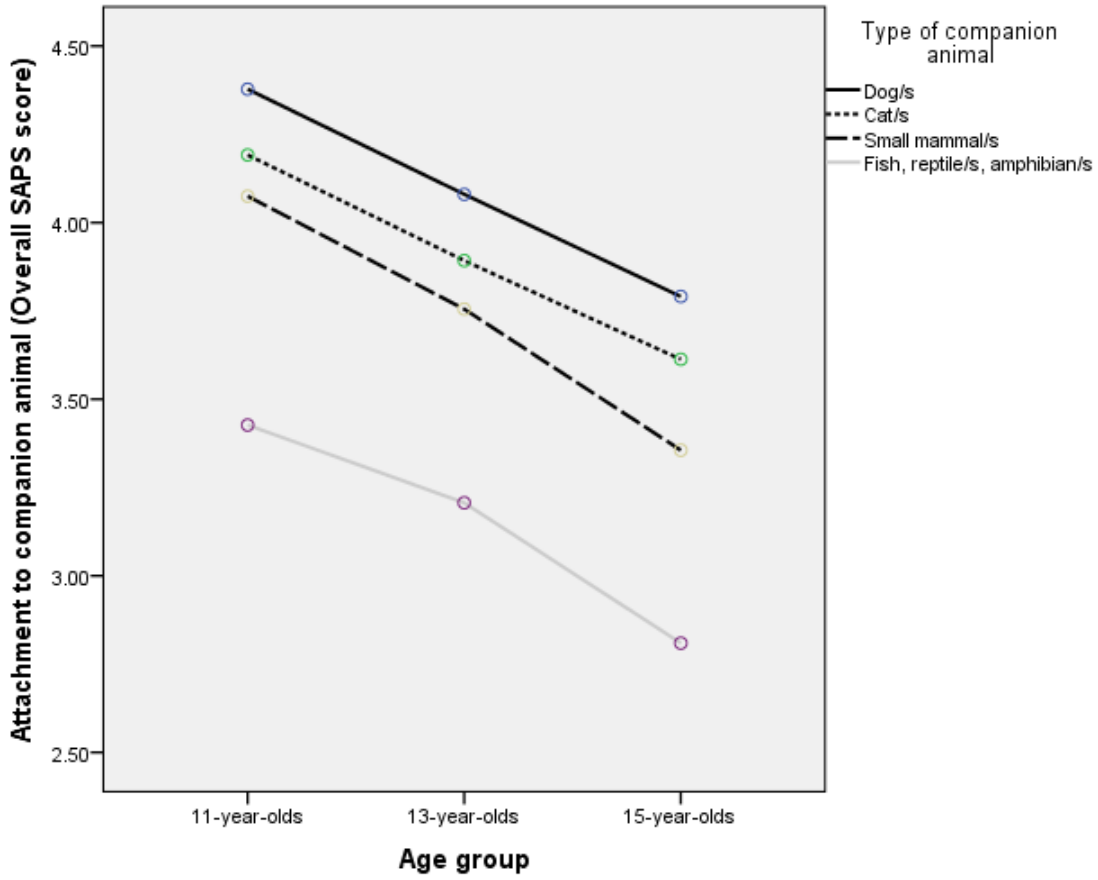


Figure 2: Girls' attachment by age and companion animal type



Does the nature of attachment vary according to animal type?

To enable comparison between children across different dimensions of the child-animal relationship and across species, each SAPS item was considered in turn. Table 3 shows that there was significant variation according to animal type for every item.

Table 3: Responses to Each Item of the SAPS According to Companion Animal Type

SAPS item Mean (Standard deviation)	**(a)** **Dog/s** **n = 1345**	**(b)** **Cat/s** **n = 633**	**(c)** **Small mammal/s** **n = 358**	**(d)** **Fish, reptile, amphibian** **n = 375**	**Post hoc data**
(1) I don't really like animals * *F* (3, 2707)= 6.08, *p* < .001, η_p^2 = .01	4.37 (1.08)	4.33 (1.08)	4.20 (1.17)	4.12 (1.12)	a > c & d b > d
(2) I spend time every day playing with my pet *F* (3, 2707)= 88.31, *p* < .001, η_p^2 = .09	4.02 (.99)	3.81 (1.09)	3.63 (1.14)	3.01 (1.30)	a > all groups b & c > d
(3) I have sometimes talked to my pet and understood what it was trying to tell me *F* (3, 2707)= 38.0, *p* < .001, η_p^2 = .04	3.38 (1.28)	3.14 (1.32)	3.22 (1.30)	2.58 (1.34)	a > b & d b & c > d
(4) I love pets *F* (3, 2707)= 24.34, *p* < .001, η_p^2 = .03	4.40 (.84)	4.30 (.93)	4.35 (.87)	3.94 (1.15)	d < all groups
(5) I talk to my pet quite a lot *F* (3, 2707)= 42.76, *p* < .001, η_p^2 = .05	3.60 (1.25)	3.38 (1.31)	3.48 (1.28)	2.76 (1.32)	a > c & d b & c > d
(6) My pet makes me feel happy *F* (3, 2707)= 58.38, *p* < .001, η_p^2 = .06	4.21 (.91)	4.11 (1.00)	4.03 (1.02)	3.44 (1.26)	a > c & d b & c > d
(7) I consider my pet to be a friend *F* (3, 2707)= 43.64, *p* < .001, η_p^2 = .05	3.96 (1.08)	3.77 (1.18)	3.77 (1.18)	3.19 (1.35)	a > all groups b & c > d
(8) My pet knows when I'm upset and tries to comfort me *F* (3, 2707)= 109.49, *p* < .001, η_p^2 = .11	3.72 (1.22)	3.43 (1.30)	2.85 (1.27)	2.54 (1.34)	a > all groups b > c & d c > d
(9) There are times I'd be lonely without my pet *F* (3, 2707)= 82.30, *p* < .001, η_p^2 = .08	3.84 (1.19)	3.61 (1.30)	3.45 (1.30)	2.69 (1.40)	a > all groups b & c > d

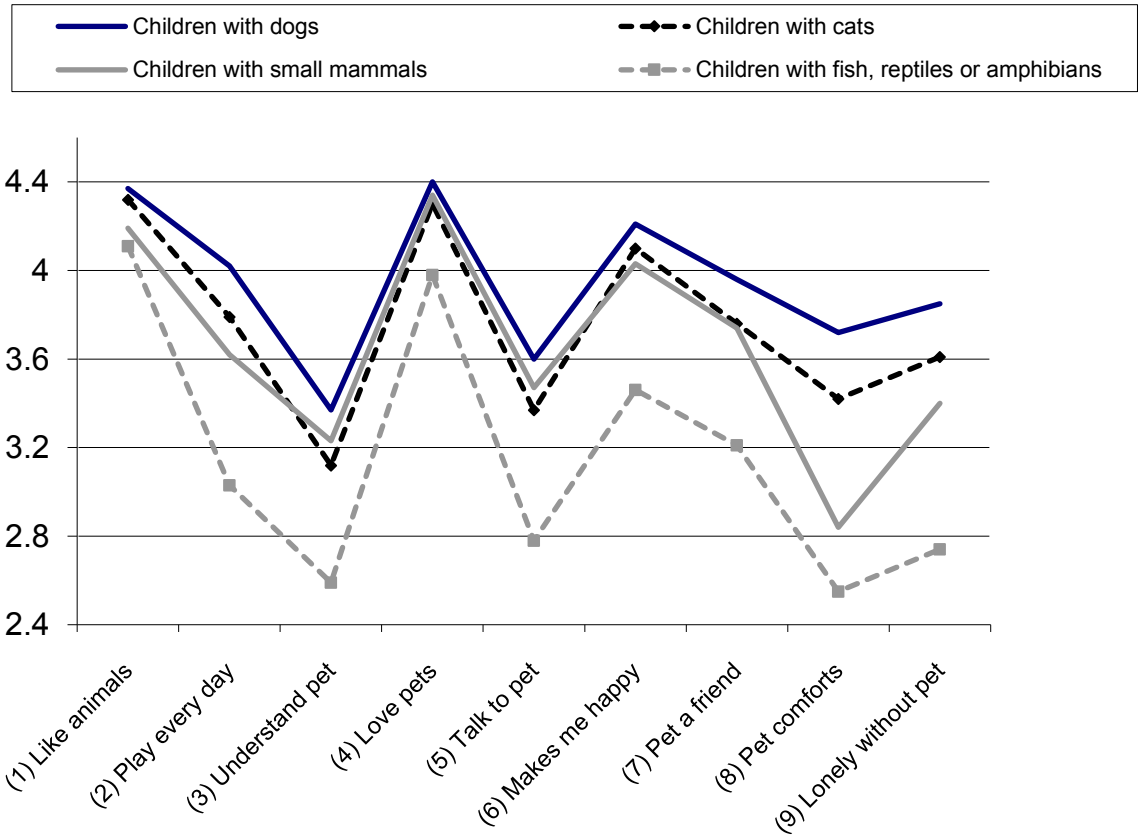
*Item 1 was coded so that a low score equated to not liking animals and a high score denoted liking them.

Figure 3 shows similarities and differences in the various aspects of attachment measured by the SAPS. Children with fish, reptiles or amphibians had significantly lower scores than the other children on all nine items, whereas those with dogs had the highest scores, significantly higher than all other children on four items. These obvious areas of difference were in the realm of spending time playing with them; believing their animal understands and comforts them, feeling lonely without them, and considering their animal a friend. This suggests, in line with findings from our earlier qualitative study, that

interactions between child and dog are perceived to be more reciprocal; socio-emotional benefits are accrued in a way that is not as evident with other animals.

When compared with children who have small mammals, those with cats feel their animals are better able to detect when they are upset and comfort them. However, although those with dogs are more likely than those with cats to report talking to their animal and understanding them, they do not differ from those with small mammals on this dimension. Perhaps physicality (playing, stroking) plays a greater role with cats, whereas small mammals, by nature of their typically confined living space, may feel easier to observe, talk to and understand.

Figure 3: Different elements of attachment according to companion animal type



Does a strong attachment to a dog have a measurable impact on socio-emotional well-being?

To examine the impact of attachment to a dog, children were categorized as being strongly attached if their overall SAPS score was the mean (3.95) or higher. Those with lower scores were categorized as 'not strongly attached'. T-tests and Chi Square analyses assessed whether these groups varied on the well-being measures.

Children with a strong attachment to their dog/s were more satisfied with their life (Cantril Ladder measure) (a small effect) and had better mental health according to Kidscreen indicators (see Table 4). However, this contrasts with the GHQ findings from 15-year-olds, where there was no significant difference. Indeed there was no effect of attachment on GHQ score for any type of animal. This may be connected to an age-related decrease in attachment to animals or to different aspects of mental health that the two measures tap.

Table 4: Differences in Mean Well-being Scores According to Strength of Children's Attachment to Dogs

	Strongly attached			Not strongly attached		
	N	Mean	Std. D	N	Mean	Std. D
Life satisfaction (Cantril) t (1, 1411) = 3.46, p < .005, d = .18	756	7.86	1.81	657	7.53	1.77
Kidscreen mental health index t (1, 1307) = 6.35, p < .001, d = .35	693	48.60	10.60	616	45.16	8.78
GHQ t (1, 550) = 1.95, n.s.	223	32.26	6.02	329	31.29	5.48

Children with a strong attachment to their dog/s also scored significantly higher on measures of perceived health, happiness, and communication with their father (see Table 5).

Table 5: Differences in Well-being According to Strength of Children's Attachment to Dogs (Categorical Variables)

		Strongly attached		Not strongly attached	
		N	%	N	%
Perceived health	Good health	613	80.9%	490	74.6%
χ^2 (1, *n* = 1415) = 8.10, *p* < .005	Poor health	145	19.1%	167	25.4%
Happy (frequency)	Always happy	216	28.6%	140	21.1%
χ^2 (1, *n* = 1417) = 10.44, *p* <. 005	Not always happy	539	71.4%	522	78.9%
Happy (extent)	Very happy	372	49.3%	259	39.1%
χ^2 (1, *n* = 1416) = 14.88, *p* < .001	Not 'very' happy	382	50.7%	403	60.9%
Confidence	Always confident	159	21.0%	102	15.5%
χ^2 (1, *n* = 1417) = 7.23, n.s.	Not always confident	598	79.0%	558	84.5%
Feeling left out	Do feel left out	284	37.5%	225	34.1%
χ^2 (1, *n* = 1417) = 1.69, n.s.	Do not feel left out	474	62.5%	434	65.9%
Feeling lonely (past week)	Felt lonely	151	20.8%	117	18.4%
χ^2 (1, *n* = 1361) = 1.27, n.s.	Did not feel lonely	574	79.2%	519	81.6%
Communication with mother	Easy	605	82.9%	497	78.6%
χ^2 (1, *n* = 1362) = 3.94, n.s.	Difficult	125	17.1%	135	21.4%
Communication with father	Easy	443	67.5%	343	58.6%
χ^2 (1, *n* = 1241) = 10.54, *p* < .005	Difficult	213	32.5%	242	41.4%

Does a strong attachment to a dog differ from a strong attachment to another animal type?

To provide more conclusive evidence of the distinctiveness of the child-dog relationship, it is necessary to examine whether strong attachment to *other* animals is linked to improved well-being. Accordingly, these children were categorized the same way, as 'strongly attached' or 'not strongly attached' according to their mean SAPS score. T-test and Chi Square analyses were repeated; findings revealing different patterns. Analysis of the eleven variables revealed two areas of difference between the groups with cats (one positive, one negative), three for those with small mammals (all positive) and none for those with fish, reptiles or amphibians.

Children with cats: Those who were strongly attached to their cats (m => 3.76) had higher scores on Kidscreen, *t* (1, 629) = 3.07, *p* <.005, *d* = .25 (*n* = 354, *m* = 47.44, *s.d.* =

10.05) than those who were not strongly attached (*n* = 277, *m* = 45.09, *s.d.* = 8.91). However, they were more likely to feel left out, χ^2 (1, *n* = 663) = 9.32, *p* >.005 (46.2% vs. 34.5%). Moreover, when compared with those who had a strong bond with other animals (using one-way ANOVA), the former had the least positive scores on all measures. Applying the same stringent *p* value of .005, they scored lower than those strongly attached to small mammals on Kidscreen, *F* (3, 1424) = 4.51, *p* < .005, η_p^2 = .009 (mean scores 47.44 and 50.71 respectively). They also scored lower on life satisfaction than all other groups, *F* (3, 1529) = 5.38, *p* < .001, η_p^2 = .01 (*m* for strongly attached to: dogs = 7.86, cats = 7.54, small mammals = 8.11, fish/reptiles/amphibians = 7.98). Additionally, a significantly lower proportion reported feeling very happy, χ^2 (3, 1529) = 19.26, *p* < .001 (39.6% compared with those strongly attached to dogs = 49.3% and small mammals = 58%).

Children with small mammals: Like children with cats or dogs, those with a strong attachment to their small mammals (m => 3.65) scored more highly on Kidscreen, *t* (1, 358) = 3.75, *p* <.001, *d* = .40 (*n* = 198, *m* = 50.71, *s.d.* = 10.92) than those 'not strongly attached' (*n* = 162, *m* = 46.61, *s.d.* = 9.48). Like those with dogs, they also scored higher on life satisfaction *t* (1, 375) = 3.43, *p* <.001, *d* = .35 (strongly attached *n* = 209, *m* = 8.11, *s.d.* = 1.77; not strongly attached *n* = 168, *m* = 7.47, *s.d.* = 1.88) and happiness χ^2 (1, *n* = 375) = 9.16, *p* >.005 (58% vs. 42.3% reported feeling very happy). Other variables approached significance but did not meet the stringent .005 level required.

To summarize, findings highlight the significance of dogs as the animals with whom children bond most. Even though attachment scores were higher for dogs than other animals regardless of age or gender, they still decrease with age and are higher among females. Examining each SAPS item revealed considerable differences in the nature of attachment. Children with dogs stand out from those with other animals in terms of

believing their animal understands and comforts them, feeling lonely without them and spending time playing with them. They are also more likely to feel their animal makes them happy and is a friend. Nonetheless, certain aspects of children's attachment to small mammals appear to be just as strong. Strong attachment to cats appears to be associated with some benefits but there are negative signs as well. Future research needs to establish whether or not this attachment is formed as a result of weaknesses in other sources of support (Bodsworth & Coleman, 2001). Having a strong attachment to fish, reptiles or amphibians has no obvious relationship with children's well-being.

Discussion

This paper has focused on how children's relationships with dogs differ from those with other types of companion animal. In our earlier qualitative study (Muldoon et al., 2015; 2016), children talked to a far greater extent about their interactions with dogs than any other animal. Their descriptions highlighted the significance of emotional reciprocity and a sense that the dog shares the child's love of play. Therefore, it seems it is not the secondary effect of increasing children's social contact that leads to well-being benefits, but the relationship in and of itself. The physicality of the interactions may be particularly important. Unlike interactions with peers, touching behavior is well-developed in child-dog interactions (Filiatre, Millot, Montagner, Eckerlin & Gagnon, 1988). This tactile dimension is clearly different with fish, reptiles, and amphibians, and cats are not always readily available for cuddles or stroking. The perception of dogs is that they are "always there." (Muldoon, et al., 2016).

Active engagement with an animal, whether through caring or play is likely to impact on children's emotional well-being due to the physiological processes involved in touch,

love, and anxiety reduction (O'Haire, McKenzie, Beck & Slaughter, 2015). Interdependence may also develop where children feel animals are reliant on them for care and companionship. Attachment to less interactive animals inevitably develops through different means. A high level of reciprocity seems important to children (Garrett, 2007), with comparable associations between dogs and small mammals.

Examining discourses surrounding the pet effect is important, as accounts of "benefits" can appear simplistic, particularly when they focus on attachment as a broad phenomenon, rather than carefully assessing differences according to animal type. Wedl and Kotrschal (2009) found children's social styles with peers broadly matched those observed in interaction with animals, suggesting that strong attachment may be a sign of a socially well-connected child. Methodologically, it is difficult to distinguish the effects of an animal from other aspects of people's lives (Vidovic, Stetic & Bratko, 1999). However, detailed qualitative studies examining different family members' perceptions of children's relationships and sociability would be extremely useful, also addressing Melson's (1990) concern that structured scales may not tap the full range of feelings a child has towards their animal. One of the strengths of the SAPS is that it was developed using both children's descriptions of their relationships and attributes they valued, as well as items from established measures. A different measure would better capture relationships with fish, reptiles and amphibians. The failure of studies to establish causality (i.e., that a strong attachment to a dog leads to positive social and emotional well-being) is the main criticism within this field, and has led to calls for longitudinal studies (e.g., Mueller, 2014).

Employing a range of methods is necessary, alongside a theoretical framework that views children's relationships with animals as part of a broader social, relational and developmental context (Tipper, 2011; Mueller, 2014). This is particularly pertinent with

dogs because they are often described (unlike other animals) as friends. While some benefits may ensue from the one-to-one relationship in itself, the interaction of this relationship with other close connections (particularly familial) is undoubtedly significant. Children are rarely wholly responsible for the care of a companion animal; activities are shared with adults (typically mothers) (Muldoon et al., 2015). Animals may be incorporated differently into the family home and a bond between child and parent may be strengthened if they communicate about and interact with an animal together. In the case of dogs, the possibility that fathers are more involved requires investigation. Furthermore, families with animals may foster a particular kind of emotional environment for children growing up, such that it is difficult to attribute improved well-being to a relationship with the animal *per se* (Kotrschal & Ortbauer, 2003). Understanding these aspects of family life is crucial to establishing with greater clarity, the impact of attachments to companion animals on children's well-being.

Looking at children's relationships within this broader context also helps to explain why the nature of attachment to animals alters as children age (see Jalongo, 2015). The SAPS shows a diminishing of attachment with age to every type of animal, but during adolescence, different provisions of support become more or less important than they have been earlier in childhood when close familial ties are foremost. Whether or not animals actually become *less* significant as children age is yet to be established. The onset of adolescence may simply be accompanied by increasing awareness of a cultural (adult) and gendered tendency to deny the significance of animals, lest one appears childish or incapable of establishing bonds with human beings (Myers & Saunders, 2002; Tipper, 2011; Muldoon et al., 2015). According to Esposito, McCune, Griffin and Maholmes (2011), developmental changes in children's interactions with animals parallel their interactions

with humans. During early adolescence (around age 9 to 14 years), friends become increasingly important (Davis & Juhasz, 1995), with a specific need for interpersonal sensitivity and mutuality. In other words, they seek empathic, supportive friendship (that they seem to find with dogs).

This paper has also highlighted the significance of gender, with girls showing stronger attachment to all animals, except fish, reptiles and amphibians. This shows the importance of examining potential variations in the ways girls and boys respond to different types of animal. In particular, it is important to consider children's play, peer relationships and bullying more generally, as differences in the way boys and girls interact with peers may well mirror their play preferences and interactions with animals (Tardif-Williams & Bosacki, 2016). How animals are cared for within the family context is also significant with respect to gender (Muldoon et al., 2015), but this has rarely been investigated. We also need to persistently question whether our measures fully encompass all aspects of attachment to animals. If a child's gender influences the way they express their thoughts and feelings about animals, it is possible that the gender differences found are a result of us capturing a more 'female' perspective.

Conclusion

Companion animals, dogs especially, have an impact on well-being when a strong emotional attachment is present (Sable, 1995; Serpell, 2006). However, the nature and extent of impact are not yet clear (Herzog, 2011; Mueller, 2014). Further work is required to explore the intricacies of the social and emotional support that different animals afford children and adolescents within a relational, developmental and familial context.

Funding

This work was partially supported by the Department for Environment, Food and Rural Affairs [grant numbers AW1404 and AW1407].

Acknowledgments

We would like to thank the children and schools for participating in the research presented in this paper.

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